

2/PARTS

### Protecting Cover

The invention relates to the fire prevention equipment and may be used as:

- 1) a means of protection of fire-brigade personnel as well as for persons involved in emergency and reconstruction works during the fires at oil and gas gushers, timber warehouses, oil and lubricant product warehouses, inflammable liquids, and industrial and residential buildings, etc.
- 2) a means for emergency evacuation from fire sites;
- 3) a steady-state construction of industrial or any other purposes.

There exists a protecting cover designed in the form of a frame of communicating tubes placed both horizontally and vertically. There are openings on the surface of tubes. The metal nets are attached to the both sides of the frame at some interval between them. The water basin is connected with the frame by means of the communicating tubes [1].

The disadvantage of this apparatus is its low efficiency caused by:

- 1) this is a vertical screen, which protects only from frontal heat flows and be placed perpendicular to the vector of heat expansion. It does not provide protection at large fires from radiation that may come from any sides; from fire products in cases when there is an explosion of flammable substances (that most of the time entails the death of people), as well as from the hazardous effect of noise. The noise at large oil and gas gusher fires may reach the levels dangerous for people's lives and health.
- 2) At any existing pressures water runs out of the tube openings only in the form of a stream and do not disintegrate into fine drops by

itself. As a result a drop-water medium is not formed in the space between the two nets as was expected in this apparatus.

The objective of this invention is a designing of efficient and mobile apparatus for the protection of people from:

- the flows of heat and visible spectrum radiation incoming from all sides;
- all-side bombarding by flammable substances in case when there is an eruption of fire products;
- hazardous effect of noise.

This objective is achieved by the following design. The protecting cover consists of at least one module comprised of walls and a ceiling. Each of the walls and the ceiling are made of two parallel surfaces equipped by a system of communicating tubes with openings, in parallel to these surfaces; the openings are equipped with sprayers, which spray the cooling liquid into the space between the parallel surfaces to form there a vapour-drop-air medium and a cooling liquid films on these surfaces.

The floor of the module is also made of a parallel surfaces and system of communicating tubes. The tube system is placed on the internal surface of the module. The system of tubes is placed on the external surface of the module. The system of tubes is placed in the space between the surfaces. The surfaces, at least one of them, are made in the form watted or perforated or punched nets. The nets of the frame are made of powder metallurgy products. The nets of the frame are made of fire-proof plastic. The nets of the frame are made of copper. The nets of the frame are made of materials covered by a metal film. The nets of the frame are made of galvanised steel wires. The size of a net cell may vary from 0,1\*0,1 till 8,0\*8,0 mm. The parallel surfaces are placed at the interval 0,3-30 cm from each other. The modules are made as telescopic. In the

walls and the ceiling there is at least one opening for the fire-fighting or emergency evacuation purposes. The diameter and the material of the wire, the size of the internal net cell, as well as the net itself ( perforated or wattled) are the same with or above the corresponding parameters of the internal net.

The butt ends (lateral facets) of the protecting surfaces are equipped with locks that connect these surfaces into modules and further connects these modules with one another.

The essence of this invention lies in the fact that the proposed construction allows to create favourable conditions for the emergency workers and firemen to work in the immediate proximity to fire core thanks to following :

- 1) In the space between the nets of the walls, ceilings, floors there forms a vapour-drop-air medium from the sprinkled liquid drops. Under the heat radiation impact, the sprinkled liquid drops start to evaporate both on their way to the nets and at the contact with the nets; liquid film on the nets also evaporates. These processes absorb the part of the heat flow falling on the nets and on the vapour-drop-air medium;
- 2) There is the reflection of the heat radiation and convective gas flows: from the nets, from the liquid film on the nets, from vapour-drop-air medium;
- 3) The external noise is reduced by the vapour-drop-air medium and liquid film on the nets;
- 4) When each of the module walls is made of more than two nets, a combined application of cooling liquid may be used: in the spaces between the first and second nets the liquid is sprayed by means of sprayers, whereas in the space between the second and

third nets the liquid is supplied in the form of an air-mechanical and chemical foam.

Thus, the degree of penetration inside the protecting module of hazardous fire factors: i.e. infrared and light spectrum of electromagnetic radiation, convective gas flows and noise impact decreases.

When the modules are connected with one another, the length of the cover may be regulated.

The sizes of the module are chosen to ensure that it can be moved manually or by means of mechanisms when regulating the cover's length.

Each consecutive module, when assembled with one another by means of connecting devices, is connected to the system of water supply. Thus, each protecting surface (be it a wall, ceiling or floor) is turned into fireproof screen which reflects and partly absorbs the hazardous fire factors, and which consists of parallel nets forming vapour-drop-air medium in the space between the nets.

The invention is explained by the drawings. Fig.1 shows the general view of one of the options of the protecting cover. Fig. 2 shows the general view of the wall. Fig.3 shows the cross-section of the wall. Fig.4 shows the wheeled option of the cover.

The protecting cover consists of a module 1, walls 2 and a ceiling 3, that are designed in the form of the parallel nets 4,5; the gap between the nets varies 0.5 –30 cm. In parallel to the net surfaces 4,5 there is a system of communicating tubes 6 with the openings 7, which are equipped with sprayers 8. The sprayers are situated in a way that allows the sprinkling liquid (water, water with surface-active substances, etc.) to form a vapour-drop-air medium in the space 9 between the nets.

The system of communicating tubes 6 may be placed in the internal surface of the module (Fig. 1,2) or on the external surfaces of the module (Fig.4), or in the space between the nets (Fig.3); the nets 4 and 5 may be made of metal, e.g. stainless steel or galvanised steel, copper, brass, fireproof plastic, powder metallurgy products, etc. The nets 4,5 may be made wattled, perforated or punched.

The wattled nets 4,5 may be made of wire with the diameter varying 0,1\*0,1 – 8,0\*8,0 mm.

The size of the net cells, diameter and the material of the wire is chosen to ensure that the cooling liquid film is formed on the internal net 4 (possibly on the external net 5) when the liquid is sprinkled into the space between the nets. In our experiments a brass (or copper) wire with diameter of 0,2 mm; the cell size was 0,5\*0,5 mm for the internal net were used. With the aim of increasing the resistance of the net to the mechanical tension, the chosen diameter and the size of the cells of the external net 5 may exceed the diameter and the cell size of the internal net 4.

When perforated or punched nets are used the net cell size and the distance between the cells of the external net 5 may exceed the corresponding parameters of the internal net 4.

On the butt-ends 10 of the modules 1 there attached locks 11, which allow to connect the modules to one another. Simultaneously, the system of tubes 6 of these modules are connected to one another as well as to e.g. fire hydrant (not shown on the drawing).

If need be, the module 1 may be equipped with floor 12 of the same construction as the walls 2 and the ceiling 3.

With the aim of facilitating the transportation of the module, it may be placed on the flat-car 13 with wheels 14. With the aim of rapid

penetration inside the burning constructions, the modules are made telescopic.

The protecting surfaces formed by the walls 2 of the protecting module 1 may be made combined. E.g., the external surface 5 may be made as a net surface (wattled, punched or perforated), whereas the internal surface 4 may be made of metal sheet (or transparent fireproof plastic, with possible reinforcement by metal nets) or made of different parts, e.g. up to the level of operator's eyes the internal surface 4 is made of net, whereas the part below the level of the operator's eyes is made of metal sheet.

The protecting cover functions as follows. The system of tubes of the module 1 is connected to the fire hydrant (fire engine, fire pumps at the water basin) by means of a fire hose and this protecting cover is placed towards the fire core. The cooling liquid through the system of tubes 6 goes to the spayers 8 and is sprayed into the space 9 between the nets. As a result a vapour-drop-air medium is formed in the space between the nets, a water film is formed on the nets. All this creates the conditions conducive to the diminishing the penetration inside the cover by hazardous fire factors. If need be, the first module 1 is connected to the next module by means of locks 11, and so forth, in order to achieve the required length of the cover.

Under the most dangerous conditions, an air is supplied from the location of the main site of the fire-fighting unit inside the protecting cover by means of an air compressor or a fan. From the opposite end of the protecting cover, which comes into the fire core, a frontal protecting wall is erected. This frontal wall may have openings for the entrance and exit of people as well as for the fire extinguishing.

### **Bibliography:**

1. Preliminary patent RU N 4665, МПК A 62 C 31/00, 1997.